

## Approach to the Environmental Analysis

This chapter generally describes the approach to the environmental resource evaluations in Chapters 5–30 of this EIR/EIS.

- The framework for the environmental consequences analyses, including any relevant evaluation timeframes, and an overview of the project- and program-level analysis elements.
- The overall organization and content of the resource-specific analyses (Chapters 5–30) and the CEQA determinations (Chapter 31).
- An overview of modeling tools and applications.

Each BDCP alternative includes conservation measures (CMs) to improve the overall ecological health of the Delta (CM2–CM11), water conveyance options by which to move fresh water through and/or around the Delta (CM1), and measures for addressing other ecological stressors in the Delta such as invasive plant species, barriers to fish migration, and predation of native fish (CM12–CM24). Detailed descriptions of the alternatives are provided in Chapter 3, *Description of Alternatives*.

### 4.1 Framework for the Environmental Analysis

The framework for the environmental resource evaluations is described below. Specific analytic approaches and variations from the information provided below are described in individual resource chapters.

#### 4.1.1 Timeframes for Evaluation

As discussed in Chapter 3, the BDCP would be implemented over a 50-year period. The CMs that make up the project alternatives have been designed to accommodate and respond over time to new information and greater scientific understanding of the Delta. Some CMs would be implemented immediately upon completion of environmental approvals. Others would be implemented over time.

**Near-Term Actions.** The issuance of permits associated with the habitat conservation plan (HCP) and natural community conservation plan (NCCP), the start-up of construction for the conveyance facilities (CM1), and the implementation of initial restoration actions (CM 2–CM11) and other conservation measures (CM12–CM24) would occur by approximately 2020.

**Early Long-Term Actions.** Additional restoration actions (CM2–CM11) would be implemented in the 5-year period (2020–2025) following issuance of permits, completion of the construction of CM1, and implementation of the restoration actions and other conservation measures identified above (as applicable to the approved project). CM12–CM24 would continue being refined during this period.

**Late Long-Term Action.** The final restoration actions (CM12–CM24) would be implemented from approximately 2025 to 2060, the end of the 50-year permit period associated with the BDCP.

## 4.1.2 Project-Level and Program-Level Analyses

To address the level of scientific and commercial data underlying the BDCP, the length of time necessary to implement and achieve the benefits of the BDCP, and the extent to which the BDCP incorporates adaptive management strategies, the project alternatives were evaluated at two levels of specificity in this EIR/EIS.

The broad environmental effects of the overall BDCP conservation strategy were evaluated at a program level of analysis. The BDCP conservation strategy incorporates an adaptive management process that is designed to facilitate and improve decision making during the implementation of the project. This process entails identifying adjustments and modifications to the Plan, as defined in the BDCP, as new information becomes available over time. Additionally, specific locations for restoration actions within the restoration opportunity areas have not been identified at this time. Design information for the restoration and conservation strategies for aquatic and terrestrial habitat and other stressor reduction measures in CM2–CM24 is currently at more of a conceptual level. Accordingly, the analyses in this EIR/EIS address the effects of typical construction, operation, and maintenance activities that would be undertaken for implementation of CM2–CM24 at a more program-level analysis, describing what environmental effects may occur in future project phases. Additional, project-level environmental review will be necessary prior to implementation of specific conservation measures other than CM1.

Design information on the water conveyance facilities and existing facility operational changes is available at a project level; consequently, the CM1 elements of the BDCP alternatives are analyzed at a project level of detail in this EIR/EIS. Chapter 3 provides a detailed description of the components of CM1, which, in summary, consist of various combinations of the following.

- New physical/structural components to divert and convey water with fish protections.
- New intakes with fish screens to divert water from locations along the Sacramento River in the north Delta.
- An intermediate forebay and pumping plant for holding the diverted water.
- Conveyance options for carrying the diverted water south, consisting of a new pipeline/tunnel, a new peripheral canal, or new diversion gates and operable barriers on existing Delta channels.
- A new forebay at Byron Tract near Clifton Court Forebay connecting to existing State Water Project (SWP) and Central Valley Project (CVP) facilities.
- Changes in existing SWP and CVP system operations that would affect the following.
  - Operation of the upstream SWP and CVP facilities and reservoirs, and associated changes in downstream river reaches.
  - Use of the South Delta intakes.
  - Water operations to improve aquatic habitat conditions and continue SWP and CVP Delta exports.

## 4.2 Resource Chapter Organization

Chapters 5–30 are organized as shown below.

- Environmental Setting/Affected Environment
- Regulatory Setting
- Methods for Analysis
- Environmental Consequences

A brief overview of each of these sections is provided below.

### 4.2.1 Environmental Setting/Affected Environment

#### 4.2.1.1 CEQA and NEPA Baselines

Because CEQA and NEPA have different directives related to using a baseline for determining the impacts of the action, this EIR/EIS uses two baselines: one for determining the impacts of state and local agency actions under CEQA and one for determining the impacts of federal actions under NEPA. The CEQA baseline for assessing significance of impacts of the project alternatives is normally the environmental setting, or existing conditions, at the time a notice of preparation (NOP) is issued (State CEQA Guidelines Section 15125[a]). The word *normally* in this context indicates that CEQA lead agencies have the discretion, where appropriate, to fully or partially update baseline conditions beyond the time of issuance of the NOP up until the time of project approval. The CEQA baseline is developed to assess the significance of impacts of the project alternatives in relation to the existing conditions at the time of the NOP. The existing conditions assumptions for the BDCP EIR/EIS includes facilities and ongoing programs that existed as of February 13, 2009 (publication date of the NOP and notice of intent), that could affect or could be affected by implementation of the proposed project and alternatives. In some instances, certain assumptions were updated within the confines created by the State CEQA Guidelines and CEQA case law.

Existing conditions for the BDCP EIR/EIS (also referred to as the CEQA baseline) include continuation of operations of the SWP and CVP by the Department of Water Resources (DWR) and the Bureau of Reclamation (Reclamation), respectively. Assumptions for the existing conditions related to operations of the SWP and CVP are described in the *Biological Assessment on the Continued Long-term Operations of the Central Valley Project and the State Water Project* (August 2008) (2008 BA) prepared by Reclamation as modified by the June 2009 National Marine Fisheries Service biological opinion (NMFS BiOp) and the December 2008 U.S. Fish and Wildlife Service (USFWS) BiOp. An important aspect of the CEQA existing conditions baseline is the exclusion of application of the *Fall X2* salinity standard. Because this standard has not yet been implemented and may not be implemented prior to approval of the BDCP, exclusion of this standard was dictated by CEQA case law, which precludes CEQA lead agencies from including in their baselines anticipated conditions not expected to occur until after project approval. Detailed assumptions for the SWP and CVP operations are represented in hydrological and water quality analytical models, as described in Appendix XX of the BDCP EIR/EIS. Appendix 4.1, *Appendix to Alternatives Development Report*, provides additional information on assumptions made for existing conditions.

Neither NEPA nor the CEQ Regulations for implementing NEPA contain a specific directive for using a baseline for determining an action's significant effects on the quality of the human environment. CEQ's *Forty Most Asked Questions Concerning CEQ's NEPA Regulations* provides that the no-action alternative may be used as a "benchmark, enabling decision makers to compare the magnitude of environmental effects of the action alternatives." Under NEPA, federal agencies have the discretion to define the baseline for assessing environmental effects of the alternatives as the no action alternative. Accordingly, this EIR/EIS uses the No Action Alternative as the baseline for determining impacts of the federal action under NEPA. As the NEPA baseline, the No Action Alternative, sometimes referred to as the *future no action condition*, considers existing conditions to include continuation of operations of the SWP and CVP as described in the 2008 USFWS and 2009 NMFS BOs and other relevant plans and projects that would likely occur in the absence of BDCP actions. Because nothing in NEPA or NEPA case law precludes NEPA lead agencies, in using No Action scenarios as baselines for impact assessment, from including anticipated future conditions, the NEPA baseline, unlike the CEQA baseline, assumes implementation of the Fall X2 salinity standard.

The No Action Alternative in the BDCP EIR/EIS describes conditions in three future periods. The first is 10 years following the issuance of take permits by USFWS, NMFS, and DFG for BDCP implementation (approximately 2020). The second is 15 years following the issuance of take permits (approximately 2025). The third is 50 years following the issuance of take permits (approximately 2060).

The No Action Alternative for the BDCP EIR/EIS entails programs, projects, and policies included in existing conditions assumptions. These assumptions also encompass programs, projects, and policies with clearly defined management and/or operational plans, as well as facilities under construction as of February 13, 2009, because such actions and facilities are consistent with the continuation of existing management direction or level of management for plans, policies, and operations. The No Action Alternative assumptions also includes facilities and programs that received approvals and permits in 2009 because those programs were consistent with existing management direction as of the NOP (Appendix 4.1).

#### 4.2.1.2 Definition of Study Area

The Environmental Setting/Affected Environment section for each of the resource topics describes the study area for the resource that might benefit or be affected by implementation of the project alternatives; identifies and characterizes existing resources; and describes historic changes and trends affecting the resource. Figures 1-3 through 1-9 in Chapter 1 depict the geographic regions considered in these analyses, although these regions do not necessarily correspond to the individual resource-specific study areas.

#### 4.2.2 Regulatory Setting

This section describes the laws, regulations, and policies that affect the resource or the assessment of impacts on the specific resource. The regulatory framework for the analysis is established in this section. Because this EIR/EIS has been developed in compliance with CEQA and NEPA, neither of these regulations is described in the resource-specific Regulatory Setting sections. Refer to Chapter 1, *Introduction*, for a brief discussion of CEQA and NEPA.

### 4.2.3 Methods for Analysis

Descriptions of the methods for analysis are provided in each resource chapter. The resource-specific assessment methods explain the approach used to identify and assess the potential environmental impacts that would result from implementation of the project alternatives. For those resource topics utilizing modeling output, a brief overview of the modeling tools and outputs is provided in Section 4.3, *Overview of Modeling Tools and Applications*, and a full description of the tools is included in the Modeling Technical Appendix. [Note to Reviewers: The Modeling Technical Appendix is under development.]

### 4.2.4 Environmental Consequences

The Environmental Consequences sections of each resource chapter addresses the direct and reasonably foreseeable indirect impacts associated with implementation of the project alternatives. Under NEPA, the purpose of an EIS is to describe and disclose the impacts of the alternatives. Under CEQA, however, the significance of the impact needs to be described. A “significant effect on the environment” is defined as a substantial, or potentially substantial, adverse change in the environment (CEQA Public Resources Code Section 21068). Therefore, to facilitate both CEQA and NEPA reviews, the Environmental Consequences sections document and describe potential impacts in the individual resource chapters. Chapter 31 provides a summary, for all resource topics, of each impact that would occur, a CEQA threshold of significance, mitigation that would reduce significant impacts, and each impact’s significance under CEQA before and after mitigation.

#### 4.2.4.1 Resource-Specific Study Areas

For some resources, the types of changes anticipated would occur only in one of the defined geographic regions; in others, changes would occur in more than one region (i.e., Upstream of the Delta Region, Delta Region, and SWP and CVP Export Service Areas). The rationale for evaluating specific geographic regions is stated in the Environmental Consequences section of each resource chapter. The study area for each resource also considers the geographic areas involved in implementation of CM2–CM24).

#### 4.2.4.2 Cumulative Effects Analysis

Under CEQA, cumulative impacts are “two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts” (State CEQA Guidelines Section 15355; Public Resources Code Section 21083[b]). CEQ’s regulations for implementing NEPA define a cumulative effect as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time” (40 CFR Section 1508.7).

Each resource chapter contains an analysis of the cumulative effects specific to that topic. In general, the analysis of cumulative impacts is often presented at less detail than is presented for direct effects of each alternative. For this EIR/EIS, cumulative impacts in the Plan Area were identified based on: (1) assumptions developed as part of CALSIM II water supply modeling, (2) information extracted from existing environmental documents or studies for the resource categories potentially

affected by each project, (3) investigation of future project plans by other state and federal agencies and private entities, and (4) knowledge of expected effects of similar projects.

#### 4.2.4.3 Mitigation Approaches

Mitigation measures are proposed when possible to avoid, reduce, minimize, or compensate for adverse environmental effects of the BDCP alternatives. Mitigation is also presented to meet CEQA's specific requirement that agency decision makers adopt all feasible mitigation available to reduce a project's significant impacts to a less-than-significant level. Mitigation measures included in the EIR/EIS are considered to be potentially feasible by the authors of the document. Ultimate determinations of feasibility, however, can only be made by agency decision makers. For each adverse effect identified in the resource chapters, mitigation measures that have not been included in the project design are proposed to address the effect on the resource. Chapter 31, *CEQA Analysis*, addresses whether the mitigation presented would reduce the impact to a less-than-significant level, based on the threshold of significance presented.

Certain design measures that have been incorporated into the design of the alternatives would be carried out as environmental commitments as part of project implementation, as opposed to mitigation<sup>1</sup> that would be necessary to be included as part of project approval to offset the environmental effects of the proposed action. Environmental commitments are measures incorporated by the project proponent, as part of the project description, to offset or otherwise address expected environmental effects. These commitments are proposed as elements of the proposed action and are considered in the environmental analysis in determining the overall effect of the particular alternative. The purpose of environmental commitments is to reflect and incorporate *best management practices* (BMPs) into the project that avoid, minimize, or offset potential environmental effects. These BMPs tend to be relatively standardized and compulsory; they represent sound and proven methods to reduce the potential effects of an action. The rationale behind including environmental commitments is that the project proponent commits to undertake and implement these measures as part of the project in advance of impact findings and determinations in good faith to improve the quality and integrity of the project, streamline the environmental analysis, and demonstrate responsiveness and sensitivity to environmental quality. These environmental commitments include BMPs identified in DWR's DHCCP Design Standards [note to reviewers: need to confirm with DWR that this document can be cited in the EIR/EIS]—for example, preparation of traffic management plans to handle construction traffic and detours, and installation of sedimentation barriers and other stormwater protections during grading. Environmental commitments that are incorporated into the alternatives are detailed in Appendix 3.2.

### 4.3 Overview of Modeling Tools and Applications

Several modeling tools were used to characterize the operational changes in water operations in the SWP and CVP systems under each alternative. These tools represent the best available technical tools for purposes of conducting the analyses at issue. The overall flow of information between the models and the general application and use of outputs for the resource evaluations are shown in

<sup>1</sup> The term *mitigation* is specifically applied in this EIR/EIS to designate measures required to reduce residual environmental impacts of the proposed project, after considering the application of all project environmental commitments.

Figure 4-1. Table 4-1 provides a description of the various modeling tools and an overview of how they may be applied for the environmental consequences analyses.

The models were used to compare and contrast the effects among various operating scenarios. The models incorporated a set of base assumptions; the assumptions were then modified to reflect the operations associated with each of the alternatives. The output of the models is used to show the comparative difference in the conditions among the different alternative scenarios. The model output does not predict absolute conditions in the future; rather, the output is intended to show what type of changes would occur. This type of model is described as comparative rather than predictive. Because of the comparative nature of these models, these results are best interpreted using various statistical measures such as long-term and year-type averages and probability of exceedance.

In general, CALSIM II is used to simulate the operations of the SWP and CVP. The output of this model is then used by the DSM2 model to simulate the hydrodynamics, water quality, and particle tracking. With the information generated from these models, the water supply, flows, and water quality can be compared under different operating scenarios. The output from these models are then used by a variety of other models to support the comparative analysis of various other resources, such as land use, economics, energy, temperature, and other water quality characteristics. Additional detailed discussions of the modeling tools and assumptions are provided in Appendix X, Modeling Technical Memorandum. [Note to Reviewers: This appendix is under preparation.]

**Table 4-1. Overview of BDCP EIR/EIS Modeling Tools**

[Note to reviewers: this table will be updated once all chapter authors have confirmed models used in their respective technical analyses.]

Model Name	Description of Model
Artificial Neural Network (ANN)	ANN mimics the flow-salinity relationships as modeled in DSM2, and provides a rapid transformation of this information into a form usable by the Statewide CALSIM II model. ANN is implemented in CALSIM II to inform the operations of the upstream reservoirs and the Delta export pumps to satisfy particular salinity requirements.
CALSIM II	CALSIM II simulates operations of the SWP, CVP, and other facilities in the Central Valley and approximates changes in river flows and exports from the Delta. The principal results of interest for this phase of evaluation are changes to: (1) Sacramento River flows, (2) exports and south Delta flows, and (3) reservoir storage conditions associated with the assumed operation of the BDCP simulated scenarios.
Central Valley Hydrologic Model (CVHM)	CVHM is a three-dimensional numerical groundwater flow model that simulates subsurface and limited surface hydrologic processes over the entire Central Valley at a uniform grid-cell spacing of 1 mile.
Central Valley Hydrologic Model - Delta (CVHM-D)	CVHM-D simulates hydrologic processes in the Delta region at a more refined grid-cell spacing of 0.25 mile (compared to the grid-cell spacing of 1 mile with CVHM).
Central Valley Production Model (CVPM)	CVPM is a multi-regional model of irrigated agricultural production and economics that simulates the decisions of agricultural producers in California's Central Valley. The model includes up to 22 crop production regions in the Central Valley and 26 categories of crops. Surface water supplies are estimated by hydrologic models and groundwater use and pumping lift are estimated iteratively with a groundwater simulation model. CVPM model versions consider responses under average hydrologic

Model Name	Description of Model
	conditions and responses during drought. The model maximizes the producer and consumer surplus to determine an optimal market solution. Output from CALSIM II surface water and groundwater models provide key modeling inputs to the CVPM agricultural production model.
Delta Simulation Model II (DSM2)	DSM2 is a one-dimensional hydrodynamic and water quality simulation model used to simulate hydrodynamics, water quality, and particle tracking. It describes the existing conditions in the Delta, as well as performs simulations for the assessment of incremental environmental impacts caused by facilities and operations. DSM2 uses flow data generated from CALSIM II outputs. DSM2 is simulated on a 15-minute time step to address the changing tidal dynamics of the Delta system.
IMPLAN	IMPLAN develops input-output estimates of the economic impacts of various activities. For water resources planning, IMPLAN estimates the income and employment effects upon local communities from water project construction and the regional effects of water transfers. Key modeling inputs for IMPLAN include output from the recreation economics analysis, CVPM, LCPSIM, and LCRBWQM.
Least Cost Planning SIMulation (LCPSIM)	LCPSIM is a simulation/optimization model that assesses the economic benefits and costs of increasing urban water service reliability at the regional level. The primary objective of LCPSIM is to develop a regional water management plan based on the principle of least-cost planning.
Lower Colorado River Basin Water Quality Model (LCRBWQM)	LCRBWQM covers nearly the entire urban coastal region of southern California and assesses the regional economic effects of water salinity within the SWP system and Colorado River Aqueduct. The LCRBWQM salinity model assesses the average annual regional salinity benefits or costs based on demographic data; water deliveries; TDS concentration; and costs for typical household, agricultural, industrial, and commercial water uses. LCRBWQM uses mathematical functions that define the relationship between TDS and items in each affected category, such as the useful life of appliances, specific crop yields, and costs to industrial and commercial customers. The key model inputs into LCRBWQM are CALSIM II and DSM2 estimates of SWP East and West Branch deliveries and the concentration of TDS in these deliveries.
Reclamation Long Term-GEN (LT_GEN)	LT-GEN is a CVP power model that estimates the CVP power generation, capacity, and project use based on the operations defined by a CALSIM II simulation. The LT-GEN Model computes monthly power generation, capacity, and project use (pumping plant demand) for each CVP power facility for each month of the CALSIM II simulation.
Particle Tracking Model (PTM) (DSM2)	DSM2 PTM generates a weighted average entrainment risk of smelt from stations throughout the Delta based on an assumed starting distribution of smelt within the Delta and PTM results. This weighting is performed through post-processing of the PTM results to represent the proportion of fish that would occur in different parts of the Delta or starting distributions. The analysis focuses on the total proportion or percent of the population that would move to the different endpoints after 30 or 60 days under a project relative to existing conditions.
Reclamation Monthly Temperature Model - Sacramento River Basin (Reclamation Temperature)	This model predicts the effects of operations on water temperatures in the Sacramento, Feather, Stanislaus, and American river basins and upstream reservoirs. The model simulates monthly reservoir and stream temperatures used for evaluating the effects of SWP and CVP operations on mean monthly water temperatures in the basin based on hydrologic and climatic input data. The model uses CALSIM II output to simulate mean monthly vertical temperature profiles and release temperatures for five major reservoirs

Model Name	Description of Model
	(Trinity, Whiskeytown, Shasta, Oroville, Folsom, and New Melones), four downstream regulating reservoirs (Lewiston, Keswick, , Natoma, and Goodwin), and four main river systems (Sacramento, Feather, American, and Stanislaus).
RMA	RMA2 (King 1986) is a surface hydrodynamic model that computes two-dimensional depth-averaged velocity and water surface elevation. RMA11 (King 1995) is a two-dimensional depth-averaged water quality model that computes a temporal and spatial description of conservative and non-conservative water quality parameters. RMA11 uses the results from RMA2 to describe the flow field. The model uses a depth-averaged approximation in the western Delta and Suisun Bay where substantial vertical gradients in salinity are often present. The model uses CALSIM outputs as inputs and produces results at a 15-minute time step.
State Water Project Power Model (SWP POWER)	SWP Power is an SWP power model that estimates the SWP power generation, capacity, and project use based on the operations defined by a CALSIM II simulation. The SWP Power Model computes monthly power generation, capacity, and project use (pumping plant demand) for each SWP power facility for each month of the CALSIM II simulation.
UnTRIM San Francisco Bay Delta Model (UnTRIM)	UnTRIM assesses the effects of sea level rise on Bay-Delta hydrodynamics and water quality. UnTRIM is a three-dimensional hydrodynamic model of the San Francisco Bay and Delta. Model outputs from UnTRIM are used to retrain ANN models with climate change and are corroborated with CALSIM II and DSM2.
Upper Sacramento River Water Quality Model (SRWQM)	SRWQM predicts the effects of operations to water temperature in the Sacramento River and Shasta and Keswick reservoirs. The model is a daily time step and provides water temperatures for each day of the 82-year hydrologic period used in CALSIM II.
Variable Infiltration Capacity (VIC)	VIC is a spatially distributed hydrologic model that solves water balance. Changes in routed stream flows from VIC simulations adjust inflows to the CALSIM II model. VIC incorporates spatially distributed parameters describing topography, soils, land use, and vegetation classes. The VIC model is driven by daily inputs of precipitation, maximum and minimum temperature, and wind speed.
CCHE2D	CCHE2D model is a two-dimensional depth-averaged, unsteady, flow and sediment transport model. The flow model is based on depth-averaged Navier-Stokes equations. The sediment transport module is used to simulate non-uniform sediment (both non-cohesive and cohesive) using non-equilibrium transport models.
Land Evaluation Site Assessment Model (LESA)	In the LESA system, the land evaluation rating is combined with the site assessment rating to determine the total rating of a specific site. The higher the total value of a site, the more likely the site is suited for long term agricultural production.
OMWEM	
Statewide Agricultural Production Model (SWAP)	SWAP is an optimization model for major crops and agricultural regions in California and uses Positive Mathematical Programming (or PMP, after Howitt 1995). SWAP has been used to estimate economic losses due to salinity in the Central Valley (Howitt et al. 2008) and economic losses to agriculture in the San Joaquin Delta (Appendix to Lund et al. 2007).

Model Name	Description of Model
Bay Area Water Quality Economics Model	
OFFROAD2007	The OFFROAD Model estimates the relative contribution of gasoline, diesel, compressed natural gas, and liquefied petroleum gas powered vehicles to the overall emissions inventory of the state.
eGRID	The Emissions & Generation Resource Integrated Database (eGRID) is a comprehensive source of data on the environmental characteristics of almost all electric power generated in the United States. These environmental characteristics include air emissions for nitrogen oxides, sulfur dioxide, carbon dioxide, methane, and nitrous oxide; emissions rates; net generation; resource mix; and many other attributes.
URBan EMISsions (URBEMIS 2007)	URBEMIS 2007 estimates air pollution emissions from a wide variety of land use projects. The model uses the California Air Resources Board's EMFAC2007 model for on-road vehicle emissions and the OFFROAD2007 model for off-road vehicle emissions.
EMission FACTors (EMFAC 2007)	The EMFAC model is used to calculate emission rates from all motor vehicles, such as passenger cars to heavy-duty trucks, operating on highways, freeways and local roads in California
AERMOD Modeling System	A steady-state plume model that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain.